Representing northern peatland hydrology and biogeochemistry with the Community Land Model

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Northern peatlands are likely to be important in future car bon cycle-climate feedbacks due to their large carbon pool and vulnerability to hydrological change. Predictive understanding of northern peatland hydrology is a necessary precursor to understanding the fate of massive carbon stores in these systems under the influence of present and future climate change. Current models have begun to address microtopographic controls on peatland hydrology, but none have included a prognostic calculation of peatland water table depth for a vegetated wetland, independent of prescribed regional water tables. We introduce here a new configuration of the Community Land Model (CLM)which includes a fully prognostic water table calculation for a vegetated peatland. We also couple our new hydrology treatment with vertically structured soil organic matter pool, and the addition of components from methane biogeochemistry. We inform and test our model based on SPRUCE experiment to get the reasonable results for the seasonal dynamics water table depths, and correct soil carbon profiles. Then, we use our new model structure to test the how the water table depth and CH_4 emission will respond to elevated CO_2 and different warming scenarios. Finally, we will test the modeling contrasting responses of the peatland carbon exchange both CO_2 and CH_4 with atmosphere to changes in water table depth.